RD-26,782/USA is a Continuation of RD-26,782 which is a CIP of RD-25,308

1. A three-dimensional faceted diamond crystal, comprising at least one dopant element which has a greater concentration toward or near an outermost surface of the crystal than in the center of the crystal, wherein the concentration of the dopant element is at a local minimum at least about 5 micrometers below the surface.

sub a1

2. The diamond crystal of claim 1, wherein the dopant element is selected from the group consisting of boron, nitrogen, hydrogen, lithium, nickel, cobalt, sodium, potassium, aluminum, phosphorous, oxygen, and mixtures of any of the foregoing.

3. The diamond crystal of claim 2, wherein the dopant element is selected from the group consisting of boron, nitrogen, hydrogen, and mixtures of any of the foregoing.

Sub a3

4. The diamond crystal of claim 1, wherein the dopant element is boron, aluminum, or mixtures of any of the foregoing.

5. The diamond crystal of claim 4, wherein nitrogen is dissolved in the crystal, and wherein the concentration of nitrogen exceeds the total concentration of dopant elements.

6. The diamond crystal of claim 5, wherein the concentration of nitrogen exceeds the total concentration of dopant elements by at least about 5 parts per million.

7. A diamond crystal according to claim 1, wherein the dopant element is selected from the group consisting of nitrogen, hydrogen, nickel, cobalt, oxygen, and mixtures of any of the foregoing.

8 A diamond crystal according to claim 1, wherein the dopant-element concentration within an outermost section of about 3 to about 50 micrometers of the crystal is in an amount of about 40 to about 10,000 parts per million.

Sub a4

9. A diamond crystal according to claim 1, wherein the concentration of the dopant element is at a local maximum at a distance less than about 5 micrometers from the surface of the crystal.

10. A diamond crystal according to claim 1, wherein the concentration of the dopant element causes an expansion of the diamond lattice toward or near the outermost surface of the crystal, thereby generating tangential compressive stresses at the surface of the diamond crystal.

11. The diamond crystal of claim 10, wherein the tangential compressive stresses are in the range of about 10 to about 5000 megapascals (MPa).

12. The diamond crystal of claim 10, wherein the generation of tangential compressive stresses increases the compressive fracture strength of the diamond, as compared to a diamond crystal in which the diamond lattice is not substantially expanded.

13. The diamond crystal of claim 12, wherein the increase in compressive fracture strength is at least about 2%.

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14. An article of manufacture which comprises the diamond crystal of claim 1.

15. A three-dimensional faceted diamond crystal containing at least one dopant element, wherein the concentration of the dopant element is greater toward or near the outermost surface of the crystal than in the center of the crystal, said crystal being further characterized by a tangential compressive stress at a surface of said crystal of up to about 5000 megapascals.

16. The diamond crystal of claim 15, having a diameter up to about 2 centimeters.

Sub a6

17. The diamond crystal of claim 15, wherein said crystal is a single crystal.

18. The diamond crystal of claim 15, having one or more twin planes.

19. The diamond crystal of claim 15, wherein the dopant element is selected from the group consisting of boron, nitrogen, hydrogen, lithium, nickel, cobalt, sodium, potassium, aluminum, phosphorous, oxygen, and mixtures thereof.

20. The diamond crystal of claim 15, comprising a coated film of doped diamond about 3 to about 50 micrometers thick on an outer surface of the crystal, wherein the concentration of the dopant element in the coated film is about 40 to about 10,000

Sub a7

parts per million greater than the concentration of the dopant element in the outer surface of said underlying diamond crystal.

21. The diamond crystal of claim 20, wherein the dopant element is diffused into the diamond crystal, and the concentration of the dopant element is about 40 to about 10,000 parts per million at a depth of about 3 micrometers to about 50 micrometers within said diamond crystal.

22. The diamond crystal of claim 15, wherein a range of tangential compressive stresses of about 10 to about 5000 megapascals is superimposed on preexisting tangential tensile stresses in said diamond crystal.

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23. A method of making a diamond crystal having a tangential compressive stress on a surface up to about 5000 megapascals, comprising the step of:

growing a three-dimensional diamond crystal by a High Temperature High Pressure process, wherein said crystal includes impurities that enrich an outer surface of the crystal in a concentration that is about 40 parts per million to about 10,000 parts per million, at a depth from the outer surface of about 3 micrometers to about 50 micrometers.

24. The method of claim 23, wherein the growth temperature for the diamond crystals is reduced by at least about 10°C after about 80% of the normal growth cycle is completed.

ADD a9